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The Dimensionality of Nations Project
Department of Political Science
University of Hawaii

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FIELD THEORY AND THE 1963
BEHAVIOR SPACE OF NATIONS

R. J. Rummel

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13. ABSTRACT

In connection with the development and testing of a field theory of international relations, the 1963 dyadic behavior of nations was analyzed to determine its dimensions. A secondary analysis was also done to determine how well these dimensions could be predicted from those found in a similar analysis of 1955 data. The major results are as follows. (1) There are a number of statistically independent dimensions of the 1963 dyadic behavior of nations, including dimensions of deterrence, Cold War, exports, students, migrants, diplomatic, military treaties, aid, and UN voting. (2) The 1963 dimensions could have been well predicted from 1955 behavior. (3) The most predictable (or most stable) dimensions of dyadic behavior are big power deterrence, diplomacy, Cold War, and international organizations. (4) The behavioral variables most undergoing shifts between 1955 and 1963 are translations, relative exports, students, anti-foreign behavior, and negative sanctions. (5) About thirty-six percent of the 1963 variation in the behavior of 182 dyads could have been predicted from their 1955 behavior. (6) Large shifts in the behavior of these dyads took place between 1955 and 1963. Those dyads shifting most were Netherlands→UK, Indonesia→UK, USSR→Egypt, and India→US; those most stable in behavior were Israel→China, Burma→Brazil, Brazil→India, and Egypt→Cuba. (7) The development of a cooperation-conflict scale for 1955 and 1963 and a plot of selected dyads on it shows that the scale measures the major 1955-1963 shifts in behavior, such as that for the U.S.S.R., China, Cuba, and the U.S.A.

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
International Behavior						
Soviet International Behavior						
Chinese International Behavior						
U.S. International Behavior						
Cuban International Behavior						
Field Theory						
Dimensions of International Relations						

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(1) There are a number of statistically independent dimensions of
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and UN voting.

(2) The 1963 dimensions could have been well predicted from 1955
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1955 and 1963 are translations, relative exports, students, anti-foreign
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"The foreign policy of nations is as variable and variegated as human life. However, just as the science of sociology aims at classifying typical intergroup relations and actions, so the science of politics in general and of international relations (foreign policy) in particular should aim at working out the typical patterns of the relations between states. Despite the great variety of political action, it is possible to break down political actions into types and categories. Such a breakdown will facilitate understanding. Unfortunately very little work has as yet been done in this important field." (Srausz-Hupé and Possony, 1950)

FIELD THEORY AND THE 1963 BEHAVIOR SPACE OF NATIONS[1]

I. INTRODUCTION

If any mathematical theory is to explain and enable man to control international events, empirical interpretations of some of its primitive terms must be made and operational definitions must be established. If the theory is concerned with a few variables and relationships, the task of building bridges between the analytic structure of the theory and observations may be a short and a relatively inexpensive one. If, however, the theory is fundamental and comprehensive, entailing a whole domain of phenomena, then the interpretation and operationalization necessary to test the theory may take years and dozens of social scientists and assistants.

One such theory is the field theory of social action which is being applied to international relations (Rummel, 1965, 1969b, 1970b; Park, 1969). The theory treats international relations as a mathematical social-time space. Nations have position and motion in this space in terms of their relative and changing characteristics, and the linear relationship between these characteristics. A set of dimensions define the empirical nature of this social space and serve to delineate the relationships among the characteristics and the spatial location of nations. The magnitude and direction of distances between nations in this space measure the relative social-time differences and similarities between nations on their socio-economic, cultural, geographic, and politico-military characteristics. That part of the social-time space defining attributes in this manner is called attribute space.

A second aspect of the social-time space and the one of concern to us here has to do with behavior. Nations are coupled by the action of one nation (actor) to another (object) into dyads which are conceived of as action units in a behavior space. This space comprises all the actions of

nations to each other and is spanned by dimensions which locate nation dyads in terms of their relative behavior.

By theory, the behavior of nations is a function of the attribute differences and similarities between them. That is, the location of dyads in behavior space is a linear function of the distance vectors between actor and object in attribute space. As a connecting link between two kinds of phenomena--international behavior and nation attributes--or between two disciplines and styles of scholarship--international relations and comparative studies (e.g., comparative politics)--the theoretical dependence of behavior on attribute distances within the context of a geometrisized social-time space is a comprehensive and fruitful view of international relations. Elsewhere, for example (Rummel, 1970b), the theory was shown to subsume six major hypotheses of international behavior[2] and to employ "attribute distance" and "dyad" as threads binding the hypotheses.

Tests of field theory (Rummel, 1969b, 1970b) have so far been on 1955 data: 1955 behavior and attribute spaces. This was to "get a feel" for the theory while data collection for other time periods was in progress. Eventually, the theory also will be tested for each of the years 1950, 1960, 1963, and 1965, as well as longitudinally through this period.

In order to test field theory, the behavior and attribute spaces of nations must be delineated as was done for 1955 (Rummel, 1969a). This is

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[2]These hypotheses were (1) the Rosenau "pre-theory" that the size, economic development, and political system (open or closed) of a nation are linked to its foreign policy behavior; (2) Galtung's status theory that nations behave in terms of an international stratification system; (3) the "realist" belief that international behavior is a consequence of relative power and the bonds between nations; (4) the theory of Quincy Wright that the probability of war between two nations is a consequence of their technological, social, political, legal, strategic, intellectual, psychic, and expectancy distance; (5) the cooperation (integrative behavior) between nations is partially dependent on their similarity in economic development, politics, culture, values, and geographic distance; and (6) the cooperation or conflict between nations is modified by their geographic distance.

a large task; requiring the collection of data on hundreds of variables for all nations and numerous subanalyses.[3] As part of this larger endeavor, data on the 1963 dyadic behavior of nations were collected and analyzed to determine the dimensions of behavior space for this year and the location of dyads within this space. This paper will report these results and compare them with the 1955 behavior space.

Whether one accepts the framework to which these results belong or the field theory they partially operationalize, however, the results are of intrinsic interest to all students of international relations. They describe (1) the interrelationship between a large range and a variety of actions for diverse nation actors and objects, (2) the patterns in these actions, (3) the major dimensions along which such behavior varies, (4) the ability to predict 1963 behavior from 1955, and (5) the major shifts in dyadic behavior 1955-1963.

The remainder of the paper will present the detailed results. Since these findings could constitute a book, in order to encompass them here the presentation will necessarily be technical, tabular, and condensed.

II. BEHAVIOR SPACE

As mentioned, my interest is to define the 1963 behavior space of nations--space which envelopes the range of actions available to a nation actor at the aggregate level. The nature of this space dictates that the selection of variables operationalizing it be catholic and also index those actions students of international relations deem most important in some sense. The selection of variables meeting these criteria and that of data availability

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[3] Such as analyzing all roll call votes in the U.N. (Pratt and Rummel, 1969) and all reported conflict behavior (Hall and Rummel, 1968).

are shown in Table 1. Appendix I gives the definitions (where necessary) and source of the data.

The dyads for which data were collected on these variables for 1963 consisted of two samples:

(1) Selected sample. This comprised all possible dyads formed from 14 nations chosen to reflect the variation along the major attributes of nations (such as economic development, size or power capability, and political orientation), cultural grouping of nations, and geographic regions. The fourteen nations were Brazil, Burma, China, Cuba, Egypt, Israel, Jordan, India, Indonesia, Netherlands, Poland, the U.S.S.R., the U.K., and the U.S.A. This sample was also used for 1955 and will be used for other periods as well to measure change in behavior.

(2) Random sample. This includes 164 dyads with both actor and object for each dyad selected randomly (using a random number table) from the population of dyads for 1963. A different random sample had been selected to determine the 1955 behavior space previously reported (Rummel, 1969a).

Data were not available for all dyads in both samples. Accordingly, missing ones were estimated using a missing data (multiple regression) estimation technique reported elsewhere (Wall and Rummel, 1969) and then inter-correlated using the product moment coefficient. The data were not transformed prior to correlation, since both the use of the product moment and raw data are dictated by field theory.

The product moment correlation matrix for both samples was factor analyzed, using the component model. Factor analysis determines a basis of behavior space, i.e., the linearly independent dimensions spanning the space. The component model was selected, rather than the common factor model, since by theory we are interested in specific as well as common variance. The

TABLE 1

Dyadic Behavior Variable List

DOMAIN [a]	Variable No.	CODE	Behavior i→j
A. Official Collaboration			
	1.	AID	economic aid
	2.	R-AID	relative [b] economic aid
	3.	TREATY	treaties
	4.	R-TRTY	relative treaties
	5.	VISITS	official visits
	6.	CONFER	co-participation in international conferneces
B. Communications			
	7.	BOOKS	export of books and magazines
	8.	R-BOOK	relative export of books and magazines
	9.	TRANSL	book translations i of j
	10.	R-TRAN	relative book translations i of j
C. Conflict			
	11.	MILVIO	military violence
	12.	NEGCOM	negative communications
	13.	NEGSAN	negative sanctions
	14.	ANTIFO	antiforeign violence
	15.	WARDEF	warning and defensive acts
	16.	CONTOT	total conflict behavior
	17.	CONINC	incidence of conflict behavior
	18.	CONALY	j is in conflict with military ally of i
D. International Politics			
	19.	MILTRT	military treaties
	20.	R-MILT	relative military treaties
	21.	WS-UN	weighted similarity on major rotated dimensions of UN voting
	22.	S-UN	unweighted similarity on major rotated dimensions of UN voting

[a] The domains serve to organize the behavioral variables according to the major international relations concept they were meant to ind x.

[b] All relative variables are calculated thusly

$$\frac{x \ i \rightarrow j \ (or \ i \leftrightarrow j),}{all \ x \ of \ i}$$

where x refers to the behavior, such as economic aid, being considered. If all x of A = 0, then the ratio is put equal to zero.

TABLE 1 (continued)

DOMAIN	No.	CODE	Behavior i→j
	23.	COLDWR	similarity in UN voting on Cold War Issues
	24.	PROCED	similarity in UN voting on UN Procedural Issues
	25.	S.AFRI	similarity in UN voting on South African Issues
E. Mobility			
	26.	TOURIS	tourists
	27.	R-TOUR	relative tourists
	28.	T/POPU	tourists/i's population
	29.	EMIGRA	emigrants
	30.	R-EMIG	relative emigrants
	31.	E/POPU	emigrants/i's population
	32	STUDNT	students
	33.	R-STUD	relative students
F. Trade			
	34.	EXPORT	exports
	35.	R-EXPT	relative exports
	36.	E/GNP	exports/i's GNP
	37.	C/EXP	largest commodity export/i's exports i→j
G. Cooperation			
	38.	IGO	intergovernmental organizations (IGO) of which i and j are both members
	39.	R-IGO	relative IGO
	40.	NGO	non-governmental international organizations (NGO) of which i and j are both members
	41.	R-NGO	relative NGO
	42	N-IGO	weighted relative IGO
	43.	N-NGO	weighted relative NGO
	44.	EMBLEG	embassy or legation
	45.	R-EMB	relative diplomatic representation
	46.	DIPLOM	diplomats sent
	47.	R-DIPL	relative diplomats sent
H. Communication System			
	48.	TELCHN	telephone linkage
I. Historical Behavior			
	49.	WAROPP	time since on opposite sides of war
	50.	WARSAM	time since on same sides of a war
	51.	LOSTER	i has lost, and not regained, territory to j since 1900 = 1; no = 0
	52.	DEPEND	i once a colony, territory or part of homeland of j
	53.	INDEP	independence of i and j predates 1946 = 1, no = 0
J. Bloc Politics			
	54.	COMBLC	common bloc membership i↔j = 2; different = 1; opposing = 0
	55.	COMPOS	bloc position index
	56.	ALLIAN	military alliance i↔j = 1; no = 0

principal axis technique was used to determine the dimensions for the component

model and those dimensions with eigenvalues greater than one were rotated to

an orthogonal varimax solution to delineate better the clusters of inter-

relationships in the data.

Sixteen dimensions accounting for 86 percent of the total variance

in behavior were found for the selected sample and are shown in Table 2.

The component scores (factor scores) for these dimensions were computed, using

the formula $S = ZF(F'F)^{-1}$, where S is the matrix of scores, Z the standardized

data matrix, and F the rotated factor matrix shown in Table 2. The scores will

be useful in helping to substantively interpret the dimensions and will be

utilized later in comparing the 1963 and the 1955 results.

Only the major and substantively obvious dimensions will be inter-

preted. The dimension accounting for the most total variance (11.1 percent)

comprises the export of books by actor to object (.87), tourists (.87),

exports (.83), military treaties (.73), and conferences (.71). Those dyads

that have high scores on this dimension are US→UK (8.98),[4] UK→US (6.13),

UK→Netherlands (2.88), US→Netherlands (2.72), and Poland→USSR (2.13). The

lowest score on the dimension is Brazil→Burma (-1.02).

This dimension, similar to the one found in the 1955 data, was

named salience. It reflects a prominence of the object to the actor's citizens

--a private international relations salience, distinct from public (which

would include conflict behavior). This dimension also seems similar to

another in the 1955 behavior space of the U.S. (Rummel, 1970b), called Anglo-

American cooperation. It comprised the exports of books, tourists, invest-

ments, exports, and emigrants, and had the highest scores (of 81 objects of U.S.

behavior) for US→UK and US→Canada.

The second dimension accounting for 6.3 percent of total variance

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[4]The arrow means that the U.S. is the actor and the U.K. is the object.
The value in parenthesis is the standardized factor score.

TABLE 2

Orthogonally Rotated Dimensions*

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	h²
												Dimensions						
1.	AID	16	-00	01	-06	03	04	02	-93	02	-01	02	03	08	12	-05	-00	91
2.	R-AID	04	02	07	-02	05	00	05	-92	02	02	-00	-02	-05	-06	05	-02	86
3.	TREATY	49	-16	00	-12	-23	-23	06	-13	-11	-09	-02	05	-04	60	-31	09	90
4.	R-TREATY	23	-14	05	-12	-32	-32	02	-95	-23	-11	-01	02	-14	63	-19	09	83
5.	VISITS	40	02	13	13	-07	-09	-02	-03	-07	-03	-14	04	-08	73	10	-07	79
6.	CONFER	71	10	09	37	-06	-06	-09	-05	-03	02	-27	04	-12	08	15	03	80
7.	BOOKS	87	-05	02	-01	-08	-18	-03	01	02	-01	07	-00	-25	08	02	-03	88
8.	R-BOOK	15	-07	01	-05	-08	-81	-04	00	-31	-00	-01	-07	-20	11	-12	00	87
9.	TRANSL	03	-03	01	08	-26	-14	10	01	-24	-53	-28	02	-50	20	-21	12	87
10.	R-TRAN	-07	01	24	06	-25	-13	-01	06	-37	-27	02	-38	-23	33	-21	11	73
11.	MILVIO	-08	-14	-17	56	-03	01	02	-01	04	-16	59	04	01	-05	-06	09	76
12.	NEGCOM	05	13	-01	86	-04	-04	09	02	04	01	-22	06	-01	06	04	-05	83
13.	NEGSAN	08	09	-00	43	13	-00	00	04	-00	10	-21	-03	04	-03	-11	63	69
14.	ANTIFO	-04	05	12	22	-11	01	-03	-00	-13	03	43	06	-02	-01	02	61	65
15.	WARDEF	-03	-05	-12	04	-11	-01	-10	-01	02	-06	80	-01	00	-04	-10	-00	70
16.	CONTOT	03	10	-03	87	-04	-03	03	02	-00	01	17	-05	00	00	-04	38	95
17.	CONINC	-00	01	-07	89	02	01	04	02	03	-03	10	04	00	-02	-06	26	88
18.	CONALY	04	18	01	29	-11	11	44	-07	-07	-27	09	-12	06	14	-29	27	62
19.	MILTRT	73	-03	04	-05	-05	-06	02	-00	05	13	12	03	-46	34	-03	-07	91
20.	R-MILT	32	-07	07	-04	-09	-03	08	04	-02	07	05	03	-79	25	-09	-05	83
21.	WS-UN	12	-80	02	-06	04	-07	12	-01	-11	-03	-03	05	02	00	46	-08	91
22.	S-UN	07	-37	01	-12	13	10	09	-01	-04	-12	-15	-03	05	-04	77	06	84
23.	COLDWR	14	-25	09	02	06	-15	30	-17	-34	07	-19	11	-06	-28	10	-23	55
24.	PROCED	10	-81	08	-05	-04	-08	08	05	01	-07	17	-16	00	24	-08	07	82
25.	S.AFRI	-19	-11	-16	-18	09	11	-16	01	08	03	-03	23	13	-01	73	-10	78
26.	TOURIS	87	-13	-03	-03	-16	-04	10	07	00	00	01	-06	-04	03	-03	-02	83
27.	R-TOUR	69	-19	-01	-09	-03	-02	15	-24	05	-02	02	02	23	14	-29	-01	76
28.	T/POPU	34	-20	-16	-09	-25	-33	14	01	-20	-15	-09	-29	-47	-11	-18	05	80
29.	EMIGRA	37	05	07	-01	-05	-78	02	04	-02	-03	07	-00	-02	13	-01	-04	79
30.	R-EMIG	-07	10	08	24	-17	-63	06	-00	14	-30	-31	13	00	19	01	08	78
31.	E/POPU	-07	-00	-02	-02	-01	-91	-01	01	-18	07	04	-07	06	05	-07	-02	89
32.	STUDNT	16	-01	-05	-03	-13	-10	-04	01	-17	06	03	-07	-14	86	02	-05	85
33.	R-STUD	27	-16	-17	-05	-37	02	07	01	03	06	-09	-53	17	39	13	08	76

TABLE 2 (continued)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	h²
34. EXPORT	**83**	-13	02	-02	-19	-00	13	-18	-25	-07	-02	01	00	24	-03	02	**92**
35. R-EXPT	14	-11	14	01	-15	-05	08	-01	**-85**	-09	-03	-09	03	23	07	-00	**89**
36. E/GNP	07	-13	10	-06	-14	-14	04	05	**-80**	-06	-03	-09	26	05	-09	02	**81**
37. C/EXP	-02	-04	04	-05	-17	-18	04	03	**-85**	03	05	10	13	08	-02	07	**84**
38. IGO	45	-01	-04	-11	**-64**	-01	09	03	-12	-19	-01	04	-13	01	-41	17	**89**
39. R-IGO	06	-04	09	05	**-86**	03	-03	02	-19	-00	07	-17	02	05	07	07	**85**
40. NGO	46	-05	-04	-12	**-52**	-19	18	05	-06	-13	-07	10	-09	12	**-51**	03	**89**
41. R-NGO	-02	00	20	09	**-82**	-12	06	02	-07	13	06	-07	-07	19	04	-18	**83**
42. N-IGO	21	-04	05	-04	**-88**	01	-03	02	-16	-08	06	-13	-03	05d	-10	12	**91**
43. N-NGO	21	01	12	02	**-83**	-18	16	01	-07	02	-01	01	-09	17	-21	-12	**90**
44. EMBLEG	19	01	**78**	-16	-13	-01	01	-06	-08	-04	-16	08	07	-01	-18	15	**78**
45. R-EMB	-06	-05	**90**	-07	-15	-01	-05	-02	-08	08	-04	-04	-05	-03	09	-05	**89**
46. DIPLOM	**59**	12	**21**	11	-04	-08	03	-33	-08	-09	-23	01	11	36	-22	18	**82**
47. R-DIPL	02	00	**63**	02	-17	-13	-05	-05	-44	-13	-08	-19	-14	33	-07	-02	**84**
48. TELCHN	35	06	16	28	-18	-09	07	-14	-25	-22	-31	-20	16	-05	-18	-04	**61**
49. WAROPP	-01	05	-09	**65**	05	07	-00	06	02	-05	16	-24	06	-06	-17	-33	**68**
50. WARSAM	09	07	-09	**37**	-16	-08	**78**	-08	-06	07	-06	08	-01	-02	-23	-17	**76**
51. LOSTER	07	-12	-01	04	06	-03	01	01	-07	**-85**	15	-00	05	-02	07	-10	**79**
52. DEPEND	-07	-00	09	-00	-15	-04	-07	00	-05	01	00	**-83**	-03	-03	-10	-05	**75**
53. INDEP	16	19	01	02	00	06	**84**	01	-07	-07	-08	01	-11	-03	16	10	**84**
54. COMBLC	14	**-87**	-01	-03	-05	05	-25	-03	-15	-04	-02	04	-06	00	09	-05	**90**
55. COMPOS	-03	**86**	04	12	04	-09	27	-03	08	-00	-05	-02	07	10	-06	09	**88**
56. ALLIAN	**56**	-34	-07	06	-19	04	25	02	-35	-22	-15	-05	-09	04	16	11	**77**
Total Variance(%)	11.1	6.3	4.1	6.9	8.1	5.6	3.7	3.6	6.0	2.9	3.6	2.9	3.3	5.8	4.8	2.8	

*Varimax rotation of the principal axes of a product moment correlation matrix. Component model. All components with eigenvalues ≥ 1.00 were rotated. Decimals omitted from loadings and communality. Loadings ≥ |.50| are underlined. Horizontal lines divide the variables by the domains given in Table 1.

reflects both bloc membership (Western, neutral, or Communist) and UN voting.
It indicates that nations that have common bloc membership (.87)[5] but are not
prominent actors in them (.86) also generally agree in UN voting (.80).[5] Dyads
with high scores on this dimension are Jordan→Israel (1.92), Poland→Cuba (1.91),
Cuba→Poland (1.80), Burma→Egypt (1.75), Egypt→Burma (1.74), USSR→Poland (1.72),
and USA→Netherlands (1.70). Those with low scores, e.g., showing least
agreement and different bloc membership, are USSR→UK (-2.15), Cuba→UK (-1.90),
Cuba→Netherlands (-1.79), USSR→Netherlands (-1.78), and Poland→US (-1.75).
The shift of Cuba from the U.S. orbit to the Communist one can be seen in
these scores. The fact that the US→USSR (-1.12) and USSR→US (-1.47) dyads are
not as low on this dimension is mainly due to voting in the United Nations,
where the U.S. because of its multiple interests was not in as much disagree-
ment with the U.S.S.R. as were the U.K. and the Netherlands. Because of the
relationship of common bloc membership and UN voting to the dimension, this
dimension will be named Cold War to indicate that it reflects the major
political division at the global level.

Moving on, the third dimension wholly involves relative diplomatic
representation (.90), the existence of an embassy or legation (.78), and the
relative number of diplomats sent to the object (.63). This is the same as the
dimension   found for the 1955 behavior space and will be similarly labeled
diplomatic behavior. For this dimension which entails relative diplomatic
exchange, the selected sample dyads with high relative diplomatic contact are
Jordan→UK (3.22), Jordan→US (3.04), Burma→UK (2.55), and Burma→US (2.68).
Those with the lowest relative diplomatic interaction are Jordan→Egypt (-3.26)

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[5]The sign is reversed in the loading to conform to the variable's
scaling.

and US→Cuba (-1.72). The direction of Jordan's diplomatic interest in 1963 is clear from these scores; Jordan's membership in the Arab League and her less than enthusiastic support of the continuing Arab pressure on Israel are the cross pressures influencing her policy.

The fourth dimension involves the military violence (.56) and negative communication (.86) variables[6] which were combined into a deterrence pattern for 1955, as well as two conflict variables—the incidence of conflict and total conflict—not previously analyzed. High dyads on this dimension are, as one might expect, Cuba→US (5.76), USSR→US (4.44), India→China (4.49), China→US (3.75), China→USSR (3.25), USSR→China (3.10), US→Cuba (2.80), Jordan→Israel (2.74), Egypt→Israel (2.55), Israel→Jordan (2.19), and China→India (2.07). The kinds of dyads high on this dimension and the high loadings of the total conflict variable (CONTOT) indicate that this is a major conflict dimension (it accounts for 6.9 percent of the total variance). This will be called a deterrence dimension, as was a similar one in the 1955 results. However, this will be labeled deterrence I behavior, since another deterrence-like dimension will be discussed later.

It is important to note that this conflict dimension is statistically independent of the others, such as salience and diplomacy, some of which clearly measure cooperation type patterns. This independence between conflict and cooperation has been consistently demonstrated, whether in analysis at the nation level (Rummel, 1966), at the dyadic level for 1955 (Rummel, 1969a) or 1963 as here, or whether dealing with the dyadic behavior of one nation toward all others (Rummel, 1970b).

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[6]It should be noted that these conflict variables are themselves the factor scores resulting from a component analysis of a range of conflict behaviors for all dyads displaying conflict behavior in 1963. See Appendix I.

The fifth dimension accounts for the second largest amount of total variance (8.1 percent) and appears to be the same as the international organization one for 1955. It has high loadings for all the governmental and nonintergovernmental international organizations and will also be named inter-national organizations. Dyads high on this dimension are UK→Netherlands (2.38), Poland→Netherlands (2.30), Jordan→Egypt (2.07), and Israel→Netherlands (2.04). Lowest on this dimension are US→Jordan (-2.05) and Cuba→China (1.86).

The migrants dimension in the 1955 behavior space also appears in the 1963 space. The sixth dimension defines a high interrelationship among the absolute number of immigrants to another country (.78) and the ratio of immigrants to population (.78), and relative books and periodicals exported to the country (.81). This is basically an immigration to U.S. dimension, with the high dyad scores for Israel→US (11.72), Poland→US (3.40), UK→US (2.51), USSR→US (2.22). The lowest score is for China→USSR (-1.20).

The seventh dimension will be skipped as it lacks a clear inter-pretation. The eighth dimension clearly defines an economic aid pattern, since, it primarily includes absolute economic aid (.93) and relative economic aid (.92). In the light of Big Power competition in the Middle East, it is interesting to note the high factor scores for this dimension: USSR→Egypt (8.56), US→India (5.63), USSR→India (5.52), China→Egypt (3.56), UK→Jordan (3.01).

Because of the lack of data, no aid variable was included in the 1955 selected sample analysis. However, aid was a variable in the analysis (Rummel, 1970b) of the U.S. behavior to all objects for 1955 and, there also, aid was statistically independent of other kinds of cooperation and conflict behavior.

The ninth dimension delineates exports, and is similar to the one found for 1955. This is a relative trade type dimension, since it involves

relative exports (.85), proportion of largest commodity exported (.85), and exports over GNP (.80). Absolute exports is most related to the salience dimension. Dyads high on the exports dimension are Brazil→US (8.29), Cuba→USSR (4.95), Egypt→USSR (3.22), Poland→USSR (2.82), Israel→US (2.13), and Indonesia→US (2.13). Lowest are USSR→US (-2.26) and Poland→US (1.51).

The tenth dimension is minor and will be ignored. The eleventh dimension involves warning and defensive acts (.80) and military violence (.59). For 1963, therefore, military violence is related to two different types of independent negative actions--negative communications and warning and defensive acts--both of a deterrent nature. Accordingly, this dimension will be called deterrence II. The deterrence I dimension was largely behavior of the Big Powers, as seen from the factor scores. Deterrence II, however, is conflict behavior of minor powers, as shown by the following high scores: Indonesia→ UK (5.92), Israel→Jordan (3.97), Egypt→Israel (4.33), Cuba→US (4.07), and UK→Indonesia (2.36). Some dyads with high scores on deterrence I have the lowest scores on deterrence II: USSR→US (-4.81), US→USSR (-3.33), China→USSR (-2.50), and India→China (-2.18).

The twelfth dimension will be left uninterpreted. The thirteenth dimension loads highly on relative military treaties (.79) and will be called a military treaty dimension. Dyads high on this dimension are Netherlands→UK (9.06), Jordan→US (5.00), UK→US (3.44), and India→US (2.14). Lowest are US→ Israel (-2.57) and US→Netherlands (-2.55).

The fourteenth dimension defines a pattern of dyadic behavior involving students (.86), official visits (.73), relative treaties (.63), and treaties (.60). High dyads on the dimension are India→US (9.42), US→India (3.81), Egypt→US (3.52), and India→UK (2.31). A similar dimension for 1955, for lack of a better interpretation, was called students. This name will also be used here.

The fifteenth dimension largely comprises overall UN voting agreement (.77) and, in particular, agreement on South African issues in the U.N. (.73). Dyads high on this dimension are Jordan→Egypt (2.49), Poland→USSR (2.41), USSR→Poland (2.21), and China→USSR (2.01).[7] Lowest in agreement on this dimension are UK→Israel (-3.38), US→Israel (-2.92), and Netherlands→UK (-2.80). This dimension will be called UN voting agreement.

The final dimension defines a third conflict pattern, comprising negative sanctions (.63) and antiforeign demonstrations (.61). Dyads highest on this are Indonesia→UK (7.09), US→USSR (5.79), and UK→Indonesia (4.18). This dimension also emerged for 1955 and will be named, as then, negative sanctions.

The sixteen dimension found to define the behavior space of nations are summarized in Table 3.

III. PREDICTING THE 1963 DIMENSION FROM 1955

This section will present the comparision of the 1955 and 1963 behavior spaces. First, however, the similarity in results for the 1963 random and selected samples should be assessed. If they are disparate we will have two different definitions of the 1963 behavior space.

Several variables included in the selected sample were omitted from the random sample because of extraordinary missing data or lack of variance. Consequently, the selected sample was reanalyzed for the same variables included in the random sample and these results will be used for comparison with those of the random sample.

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[7]China's values on the UN voting variables were estimated from the other behavioral variables using a multiple regression estimation program. The estimates were based on the highest loading variables on the orthogonally rotated dimensions of correlation matrix computed across missing data. That China should be in relatively close agreement with the U.S.S.R. in 1963 voting, but not as close as Poland, helps increase our confidence in the missing data estimation procedure.

TABLE 3

1963 Dimensions of Behavior Space
Selected Sample

	Dimensions	Scores	
No.	Name	High Positive	High Negative
1	**Salience**	US→UK	Brazil→Burma
2	Cold War	USSR→UK	Jordan→Israel
3	Diplomatic	Jordan→UK	Jordan→Egypt
4	Deterrence I	Cuba→US	(none)
5	International Organizations	UK→Netherlands	US→Jordan
6	Migrants*	Israel→US	China→USSR
7	(unnamed)		
8	Aid*	USSR→Egypt	(none)
9	Exports*	Brazil→US	USSR→US
10	(unnamed)		
11	Deterrence II	Indonesia→UK	USSR→US
12	(unnamed)		
13	Military Treaties*	Netherlands→UK	US→Israel
14	Students	India→US	
15	UN Voting Agreement	USSR→Poland	UK→Israel
16	Negative Sanctions	Indonesia→UK	

*Signs reversed.

First, both the random and selected samples yield 14 dimensions at the eigenvalue-one cutoff for 51 behavior variables. The fourteenth dimension for the random sample is, however, very close in eigenvalue (difference=.025)[8] to the thirteenth and is without any high loadings above an absolute value of .45. It will consequently be dropped in the following comparisons.

Canonical analysis was used to compare the results of the two samples, since I am seeking the linear transformations of the random _and_ selected results which give the best linear fit between them.

From the canonical analysis, we find that the trace correlation between both sets of results is .77. That is, about sixty percent of the variation in the position of variables[9] in the random sample behavior space is the same as that in the selected sample space. The canonical analysis rotates the dimensions of each space until the most similar (correlated) dimensions between the two studies are found. The canonical correlations for the similar pairs of dimensions are in decreasing order: .99, .97, .95, .92, .91, .87, .84, .72, .68, .57, .55, .21, .05. In effect, then, except for a few dimensions, the results of the two samples are fairly alike.

The dimensions of the selected sample which are most different from those found for the random sample are the three conflict behavior ones: deterrence I and II, and negative sanctions. This is not surprising, since conflict behavior is a rarity among dyads[10] and the selected sample includes

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[8] If two eigenvalues are identical, their corresponding eigenvectors are indeterminate.

[9] The matrices being compared are the factor _loading_ matrices. Only a handful of the dyads were the same between the two samples, thus the scores could not be compared.

[10] Only about five percent of the dyads in the system have been found to have any conflict behavior.

a very high proportion of the high conflict dyads. Dimensions of the selected
sample closest to those found in the random sample are <u>Cold War</u>, <u>salience</u>,
<u>UN voting</u> and <u>migrants</u>.

Based on the random-selected comparison, only the selected sample
space need to be used in the following analyses. The choice of the selected
sample will later enable the 1955 and 1963 scores for dyads to be compared,
since the same sample is used for both years. There are three alternative
ways to view the comparison of the 1963 behavior space with that for 1955:

(1) as a determination of the similarity of the two sets of dimen-
sions, as in the case of the random and selected sample above;

(2) as a way of specifying how well 1963 nation dyadic behavior could
have been linearly predicted from 1955:

(3) as a measurement of change--the shift in dimensions and beha-
vior of dyads between 1955 and 1963.

Within our methodology, assuming one of the alternative viewpoints
does not preclude the other two. For the techniques to be used will provide
answers simultaneously to all three. In discussing these answers, I will
tend to concentrate on the prediction view, although adding some comments on
comparison and change.

"Transformation analysis," or what is sometimes called the "factor
comparison technique" will be the comparison method employed. It is discussed
elsewhere (Rummel, 1970a, Section 20.2.3) and simply consists of the regres-
sion of the 1963 dyadic loading matrix (F_2) on that for 1955 (F_1). Then the
model is

$$F_2 = F_1 B + E, \tag{1}$$

where E is the error of fit (or prediction) and B is a transformation matrix.
Then the best (least squares) prediction of the 1963 dyadic behavior is $\hat{F}_2$, where

$$\hat{F}_2 = F_1 B, \qquad (2)$$

$$F_2 - \hat{F}_2 = E. \qquad (3)$$

The matrix $\hat{F}_2$ provides us with the prediction and E with the comparison, that is E measures the shift in behavior between 1955 and 1963.

The remaining portion of this section will examine how well we can predict the dimensions using these equations. The next section will focus on the scores. An immediate problem in computing the transformation matrix B in equation (1) is that the F_1 and F_2 matrices must be defined for the same variables.[11] Accordingly, for both the 1955 and 1963 random and selected samples, variables that were not the same for the two analyses were omitted from the loading matrices. The number of variables common to both years is thirty-five.[12]

Computing matrix $\hat{F}_2$ for the random and the selected samples, we get the results shown in Table 4. These correlations are computed between all the elements of F_2 and the corresponding elements of $\hat{F}_2$.

As can be seen from the Table, the dimensions of 1963 dyadic behavior for both samples could have been well predicted by knowing those for 1955 (and the transformation matrix). Or to look at these results with a different perspective, the dimensions of dyadic behavior are fairly stable between 1955 and 1963. If we define system change as change in the dimensions defining the behavioral system, then there was little system change between these two years.

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[11]The 1955 behavior dimensions used here are given in Table 1 of Rummel (1969b). They differ slightly from those reported in Rummel (1969a), since the latter were computed for data matrix with missing data; the former were computed on the same data, but with the missing data estimated so that factor scores could be determined.

[12]The 1963 factor loading matrix for the 1963 selected sample from which variables were omitted is not exactly the same as that interpreted in the last section. In connection with another study, results of a component analysis of the selected sample with 5 variables deleted were available.

TABLE 4

Correlations Between 1955 Predicted
and Actual 1963 Dimensions of Behavior*

$$F_2$$
(1963)

	Random Sample	Selected Sample
Random Sample	.80 (.79)	N.C.
Selected Sample	N.C.	.84 (.83)

F_2
(1955)

*The coefficient in parenthesis is the intraclass; the other the product moment. N.C. means not calculated.

The correlation found between 1963 dyadic behavior dimensions and their predictions were computed over all the dimensions. However, it should be expected that some dimensions will be better predicted than others (or with the other perspective, some dimensions should change less than others). We can look at this in detail, by looking at the correlations between specific dimensions in the 1963 selected sample loading matrix[13] F_2 and their predictions in $\hat{F}_2$. Table 5 orders the interpreted dimensions in terms of how correlated[14] each is with the corresponding 1955 dimension in $\hat{F}_2$.

From the Table, we can see that the most stable dimension--the one most predictable from 1955--in the selected sample is <u>deterrence I</u>. This reflects the consistency of Big Power conflict behavior. Compare the pre-dictability of <u>deterrence I</u> and that of <u>deterrence II</u>, the small nation conflict pattern. Deterrence II has almost the lowest predictability (only a little more than ten percent of 1955 variation in deterrence II is in common with that for 1963), representing the transitory nature of interrelationships among small nation conflict behavior.

The <u>Cold War</u> dimension is also fairly stable--predictable--between the two years, as expected. <u>Deterrence II</u> and <u>Cold War</u> behavior mirror a fundamental division between Big Powers. Because of its basic politico-economic and religious nature, the behavioral outlines of this division can

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(12 cont.) Rotation with eigenvalue criterion of 1.0 of this reduced, 51 variable, set produced 14 factors.... Of the 5 omitted variables, only one was also used in the 1955 B-space analysis. Since the other 4 variables would have been deleted from factor comparison in any case, the above expedient was judged on acceptable procedure." (Williamson, 1970)

[13] For the rest of this section, only the comparisons with the selected sample will be given.

[14] These correlations are from the transformation matrix B, normalized by row. See Rummel (1970, Section 20.2.3), in which L is the notation for the transformation matrix.

TABLE 5

Correlations Between 1963 Behavior Dimensions
and Corresponding Dimensions Predicted from 1955

Dimension*	Correlation**
Deterrence I	.98
Diplomatic	.96
Cold War	.95
International Organizations	.94
UN Voting Agreement	.86
Negative Sanctions	.79
Exports	.78
Student	.77
Migrants	.76
Salience	.61
Deterrence II	.32

*Only dimensions are shown from Table 2 that were given an
interpretation and for which defining variables were
included in both 1955 and 1963.

**Product moment.

only alter slowly with time (barring a World War).

There is one more aspect of these dimensions we can examine before moving to the dyadic behavior itself. The dimensions may be stable, while the relationship of specific behaviors to the dimensions (the loadings of specific behavioral variables) can undergo great shifts. We can measure these shifts by squaring the loadings in F_2 and $\hat{F}_2$, subtracting the squared values in $\hat{F}_2$ from those in F_2, and squaring the difference. Then if we sum the rows of the resulting difference matrix, we get a change (or prediction) measure for each behavioral variable. More precisely, if $\alpha_{j\ell}$ is the loading of the jth behavioral variable on the ℓth 1963 dimension, and $\hat{\alpha}_{j\ell}$ is its prediction, then our change measure, C, is

$$C_j = \sum_{\ell=1}^{p} (\alpha_{j\ell}^2 - \hat{\alpha}_{j\ell}^2)^2, \tag{4}$$

for p dimensions. The reason for squaring the difference, rather than taking absolute values, is to weight those large changes on one dimension.

Table 6 shows those behavioral variables undergoing the greatest shift between 1955 and 1963. That is, these behaviors changed most in their correlation with other kinds of dyadic behavior.

The above results overview the relationship between the 1955 and 1963 behavior and dimensions. There is one other aspect of the behavior space, perhaps the most important for the student of international relations, which deals with the behavior of specific dyads. The prediction of this behavior will be presented in the final section.

TABLE 6

Dyadic Behavior Shifting Most Between
1955 and 1963

Behavioral Variable	C*
translations i→j	.33
relative exports i→j	.21
students i→j	.20
anti-foreign behavior i→j	.20
negative sanctions i→j	.19
tourist i→j	.16
time since on opposite sides of war i→j	.15
relative treaties i→j	.15

*This is a coefficient of change explained in the text. High values mean large shifts in behavior.

IV. PREDICTING SPECIFIC 1963 DYADIC
BEHAVIOR FROM 1955

In determining our ability to predict 1963 scores from 1955, I will be applying a rather severe criterion: given the data available to us in 1955, how well could we have predicted behavior in 1963 for which there were more and better data? More specifically, how will the variation of dyads on the 1955 selection of variables predict to their variation on the more comprehensive collection for 1963?[15]

Without any testing, we already have a partial answer to this. For 1955, there were twelve dimensions defining B-space at the eigenvalue-one cut-off; for 1963 we found sixteen dimensions at the same cutoff. Since these are orthogonal dimensions, there are then four more independent patterns of variance in 1963 than 1955 and these four are linearly unpredictable from 1963. That is, behavior in 1955 is more tightly structured than in 1963.

Looking specifically at our ability to predict overall 1963 dyadic behavior from 1955, the dyadic score estimation matrix $\hat{S}_2$ for 1963 was computed from 1955 behavior. The product moment correlation between all the scores of the 182 dyads for 1963 (S_2) and those estimated from 1955 ($\hat{S}_2$) according to equation (1) is .60. The intraclass correlation—a more severe measure of correspondence between estimate and actual—is .53. Taking the product moment as our guide, then, we could have predicted 36 percent of the variation of dyadic behavior in 1963 by knowing the 1955 behavior space.

The reason for this low level of prediction is the large shifts in behavior that took place between 1955 and 1963, such as with Cuba, the U.S., the U.S.S.R.,and China.This shift will be examined in greater detail later.

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[15]Economic aid, for example, was available for 1963, but not 1955.

First, however, let us consider which 1963 behavior dimensions are best predicted from 1955. Table 7 shows those dimensions on which at least 50 percent of the variance in 1963 dyadic scores were predicted. As can be seen, behavior on the diplomatic and international organization dimensions are the best predicted. Of all sixteen 1963 dimensions, aid is the poorest predicted, having .23 as the highest of its correlations with the dimensions predicted from 1955. This suggests that the variance in scores defined by aid was not tapped by non-aid variables and dimensions comprising the 1955 space: that aid was also independent of other kinds of behavior in 1955.

What are these predictions in terms of the actual scores? Space does not allow presentation of all the 1963 scores and estimates, but we can study the high positive and negative scores. Table 8 shows these for each dimension.

Considering again our alternative ways of viewing these comparisons, we can say that Table 8 shows the difference between predicted and actual behavior. Also, however, the Table shows the shift in behavior of the selected dyads from 1955 to 1963: a measurement of behavioral change.

Viewing the Table this way, some interesting changes can be noted. For example, for the first dimension, we can see that the Netherlands, Brazil, Cuba, and Israel no longer have the same salience (recall that this is a salience to the population and not necessarily to the foreign policy decision making elite) in 1963 and that the U.K. has increased greatly in salience in the meantime.

Behavior on the Cold War dimension has changed since 1955, where USSR→US was highest, to a lower tempo between the US and the USSR in 1963. The high of Cuba→US in Cold War behavior in 1955 is extraordinary, but evidence of the existence of this Cuba→US "tension" or "distance" has

TABLE 7

Correlations Between 1963 Dyadic
Behavior Scores and Predictions from 1955*

1963 Dimension	Predictions of 1963 Dimensions							
	F_3	F_5	F_{12}	F_6	F_4	F_1	F_{11}	F_7
F_3: Diplomatic	.95							
F_5: Intergovernment Organization		.89						
F_{12}: (Unnamed)			.88					
F_6: Migrants				.78				
F_4: Deterrence I					.77			
F_1: Salience						.76		
F_{11}: Deterrence II							72	
F_7: (Unnamed)								71

*This is from the normalized B matrix (regression coefficient) matrix for
Equation (1). See text for discussion. Dimensions are ordered by size of
correlation and only those with a correlation greater than the absolute
value of .70 are shown.

TABLE 8

High Positive and Negative Dyadic Scores
for 1963 Behavior and 1955 Predictions*

Dimension	High Positive		High Negative	
	1963	1955	1963	1955
F_1: Salience	US→UK (8.98) UK→US (6.13) UK→Netherlands (2.88) US→Netherlands (2.72) Poland→USSR (2.13)	US→UK (5.10) UK→US (5.09) UK→Netherlands (3.25) US→Netherlands (3.09) US→Brazil (2.45) US→Cuba (2.20) US→Israel (2.17)	Brazil→Burma (-1.02)	Egypt→UK (-1.01)
F_2: Cold War	USSR→UK (2.15) Cuba→UK (1.90) Cuba-Netherlands (1.79) USSR→Netherlands (1.78) Poland→US (1.75)	USSR→US (2.51) USSR→UK (1.42) UK→USSR (1.32) Cuba→US (1.22)	Jordan→Israel (-1.92) Poland→Cuba (-1.91) Cuba→Poland (-1.80)	Jordan→Israel (-1.57) Israel→Jordan (-1.16) USSR→Poland (-1.02)
F_3: Diplomatic	Jordan→UK (3.22) Jordan→US (3.04) Burma→US (2.68) Burma→UK (2.55)	Jordan→UK (2.29) Jordan→US (2.27)	Jordan→Egypt (-3.26) US→Cuba (-1.72)	Israel→Jordan (-1.71) Cuba→US (-1.68)
F_4: Deterrence I	Cuba→US (5.76) India→China (4.49) USSR→US (4.44) China→US (3.75) China→USSR (3.25) USSR→China (3.10) US→USSR (3.10) US→Cuba (2.80) Jordan→Israel (2.74) Egypt→Israel (2.55) Israel→Jordan (2.19) China→India (2.07)	Cuba→US (4.16) US→USSR (3.16) China→US (3.10) China→USSR (2.52) USSR→US (2.25)		

*Scores for 1963 are standardized as were those for 1955 used to estimate them. All scores over |2.00| are presented. Only those factors given substantive interpretation are shown.

TABLE 8 (continued)

Dimension	High Positive		High Negative	
	1963	1955	1963	1955
F₅: International Organizations	US→Jordan (2.05) Cuba→China (1.86) US→China (1.76) Netherlands→China (1.75) UK→Jordan (1.75) UK→China (1.73)	Jordan→China (1.54) Israel→China (1.52) Egypt→China (1.49) Burma→China (1.46) Indonesia→China (1.46) China→Jordan (1.44)	UK→Netherlands (-2.38) Poland→Netherlands (-2.30) Jordan→Egypt (-2.07) Israel→Netherlands (-2.04)	Egypt→UK (-2.31) India→UK (-1.91) Netherlands→UK (-1.80) Brazil→US (-1.68)
F₆: Migrants	Israel→US (11.72) Poland→US (3.40) UK→US (2.51) USSR→US (2.22)	Israel→US (5.71) UK→US (4.37) Netherlands→US (2.24) Netherlands→Indonesia (-1.76)	China→USSR (-1.20) India→US (-1.16)	UK→Cuba (-2.05) US→Cuba (-1.45) China→USSR (-1.42) USSR→China (-1.26) UK→Brazil (-1.12) USSR→Poland (-1.03)
F₉: Exports**	Brazil→US (8.29) Cuba→USSR (4.95) Egypt→USSR (3.22) Poland→USSR (2.82) Israel→US (2.13) Indonesia→US (2.00)	Cuba→US (4.00) Brazil→US (2.07) China→USSR (2.03) Poland→USSR (1.46) Israel→US (1.18) USSR→China (1.05)	USSR→US (-2.26) Poland→US (-1.51) Indonesia→Netherlands (-1.34) Jordan→US (-1.17)	USSR→US (-1.09)
F₁₁: Deterrence II	Indonesia→UK (5.92) Egypt→Israel (4.33) Cuba→US (4.07) Israel→Jordan (3.97) UK→Indonesia (2.36)	Jordan→Israel (2.74) Cuba→US (2.65) Israel→Jordan (2.31) Brazil→US (1.23)	USSR→US (-4.81) US→USSR (-3.33) China→USSR (-2.50) India→China (-2.18) USSR→China (-1.82) UK→USSR (-1.80)	USSR→US (-4.01) USSR→UK (-1.78) UK→USSR (-1.77) China→USSR (-1.24) US→USSR (-1.14) US→China (-1.12) China→US (-1.10)

**Signs on scores reversed.

TABLE 8 (continued)

Dimension	High Positive		High Negative	
	1963	1955	1963	1955
F_{13}: Military Treaties**	Netherlands→UK (9.06) Jordan→US (5.00) UK→US (3.44) India→US (2.14) Netherlands→US (1.57) Israel→UK (1.40) China→Egypt (1.24) UK→Netherlands (1.23) USSR→Egypt (1.20)	UK→US (1.52) Israel→US (.97) Cuba→US (.94) Brazil→US (.89)	US→Israel (-2.57) US→Netherlands (-2.55)	UK→USSR (-1.17) China→USSR (-1.14) USSR→China (-.91)
F_{14}: Students	India→US (9.42) US→India (3.81) Egypt→US (3.52) India→UK (2.31)	China→USSR (2.38) India→UK (2.19) India→US (1.78)	Netherlands→UK (-1.82) Israel→UK (-1.75) USSR→Cuba (-1.15) USSR→China (-1.11) Poland→USSR (-1.01)	Poland→China (-1.01) UK→Brazil (-.96) USSR→Poland (-.95) UK→Cuba (-.92)
F_{15}: UN Voting Agreement	Jordan→Egypt (2.49) Poland→USSR (2.41) USSR→Poland (2.21) China→USSR (2.01)	China→USSR (2.41) Cuba→Burma (1.25) Burma→Cuba (1.24)	UK→Israel (-3.38) US→Israel (-2.92) Netherlands→UK (-2.80) Israel→UK (-2.45) UK→Egypt (-2.27) UK→Brazil (-2.27) UK→Netherlands (-2.24) UK→India (-2.23) Brazil→UK (-2.10)	US→Israel (-2.04) US→USSR (-1.92) UK→Netherlands (-1.65) UK→USSR (-1.58) UK→India (-1.57) Egypt→UK (-1.30) UK→Israel (-1.24) US→India (-1.16) UK→Brazil (-1.13)
F_{16}: Negative Sanctions	Indonesia→UK (7.09) US→USSR (5.79) UK→Indonesia (4.18)	US→USSR (1.61) UK→USSR (1.09)	China→India (-3.22) Cuba→US (-2.86) China→US (-2.33)	

**Signs on scores reversed.

appeared in other analyses. Since 1955 antedates the Cuban revolution and shift to a Communist ideology, there were evidently seeds of Cuba→US conflict as early as 1955. Identifying this as we have done here suggests that such potential conflicts might be systematically measured before they become manifest.

Skipping down to the deterrence I dimension, the shift from almost pure Big Power (except for Cuba→US) conflict behavior to a more generalized deterrence involving smaller Powers is shown. The China→USSR conflict behavior appears in 1955 (before commentators had noted its existence) and is greater in 1963 along this dimension, while the USSR→China conflict behavior shows itself in 1963.

The other dimensions have equally interesting shifts and these are included in Table 8 for the reader's study. Table 9 rank orders those dyads among the 182 that had the largest shifts in behavior 1955-1963. For comparison, those dyads having the least change are also shown.

A summary of the shifts in behavior for the major actors, the U.S., the U.S.S.R., and China, toward each other is shown in Figure 1. This table graphically illustrates the major changes in behavior which have occurred between 1955 and 1963. Similarly for the U.S., the U.K., and Cuba, Figure 2 shows the shifts in their behavior. The zero line in each chart is the average score for the selected sample of 182 dyads on the sixteen dimensions.

The dimensions for 1963 and their predictions enable us to form a conflict-cooperation scale for 1963 and 1955 which will summarize the shifts in behavior of dyads between the two years. We can do this by adding together

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[16] See Park (1969) for the application of a similar scale to conflict and cooperation in Asia.

TABLE 9

Dyads With the Greatest and Least Change in Behavior, 1955-1963

Dyad / Greatest Shift	Shift/a	Dimensions (score difference)/d
Netherlands→UK	91.0	military treaties (8.43)/b,c deterrence II (-2.44)
Indonesia→UK	86.0	negative sanctions (6.70) (unnamed))F$_{10}$ (5.64)
USSR→Egypt	76.2	aid (8.46)/b,c
India→US	69.1	students (7.64) military treaties (2.16)/b,c
Netherlands→US	64.2	(unnamed)F$_{10}$ (-7.10) deterrence II (-2.17)
Brazil→US	63.8	exports (6.22)/b students (2.71) military treaties (-2.18)/b,c
Israel→US	57.5	migrants (6.01)/b salience (-2.30) military treaties (-2.06)/b,c
US→India	47.6	aid (5.69)/b,c students (3.14)
Israel→UK	40.8	(unnamed)F$_{12}$ (-5.23)
Jordan→US	40.7	military treaties (4.78)/b,c (unnamed) F$_7$ (2.69)
Burma→UK	37.4	(unnamed) F$_{12}$ (-5.56)
US→UK	34.9	salience (3.87)
Poland→USSR	34.1	(unnamed) F$_{10}$ (-4.44)
Jordan→Egypt	31.7	(unnamed) F$_{12}$ (-3.03) UN voting agreement (2.54) diplomatic (-2.40)
Israel→Jordan	31.6	(unnamed) F$_{10}$ (-4.50) deterrence I (2.28)
USSR→India	31.4	aid (5.24)/b,c
Netherlands→Indonesia	31	(unnamed) F$_{10}$ (-4.53) migrants (-2.18)/b
India→China	30.7	deterrence I (4.58)
UK→Indonesia	30	negative sanctions (3.82) deterrence II (2.23)

Dyad / Least Shift	Shift/a	
Israel→China	.6	
Burma→Brazil	.9	
Brazil→India	1.1	
Egypt→Cuba	1.1	
Brazil→Poland	1.1	
India→Brazil	1.1	
Brazil→China	1.4	
Indonesia→Egypt	1.4	
Netherlands→India	1.6	
Egypt→Indonesia	1.6	
Cuba→Egypt	1.6	
Indonesia→Burma	1.6	

/a These values are summed squared differences in standardized factor scores between S$_2$ and Ŝ$_2$.

/b ... reversed

/c the defining variables were not included in the 1955 analysis, this dimension only appears in 1963.

/d ... on which the difference is $\geq |2.00|$ are shown.

FIGURE 1

DIMENSIONS
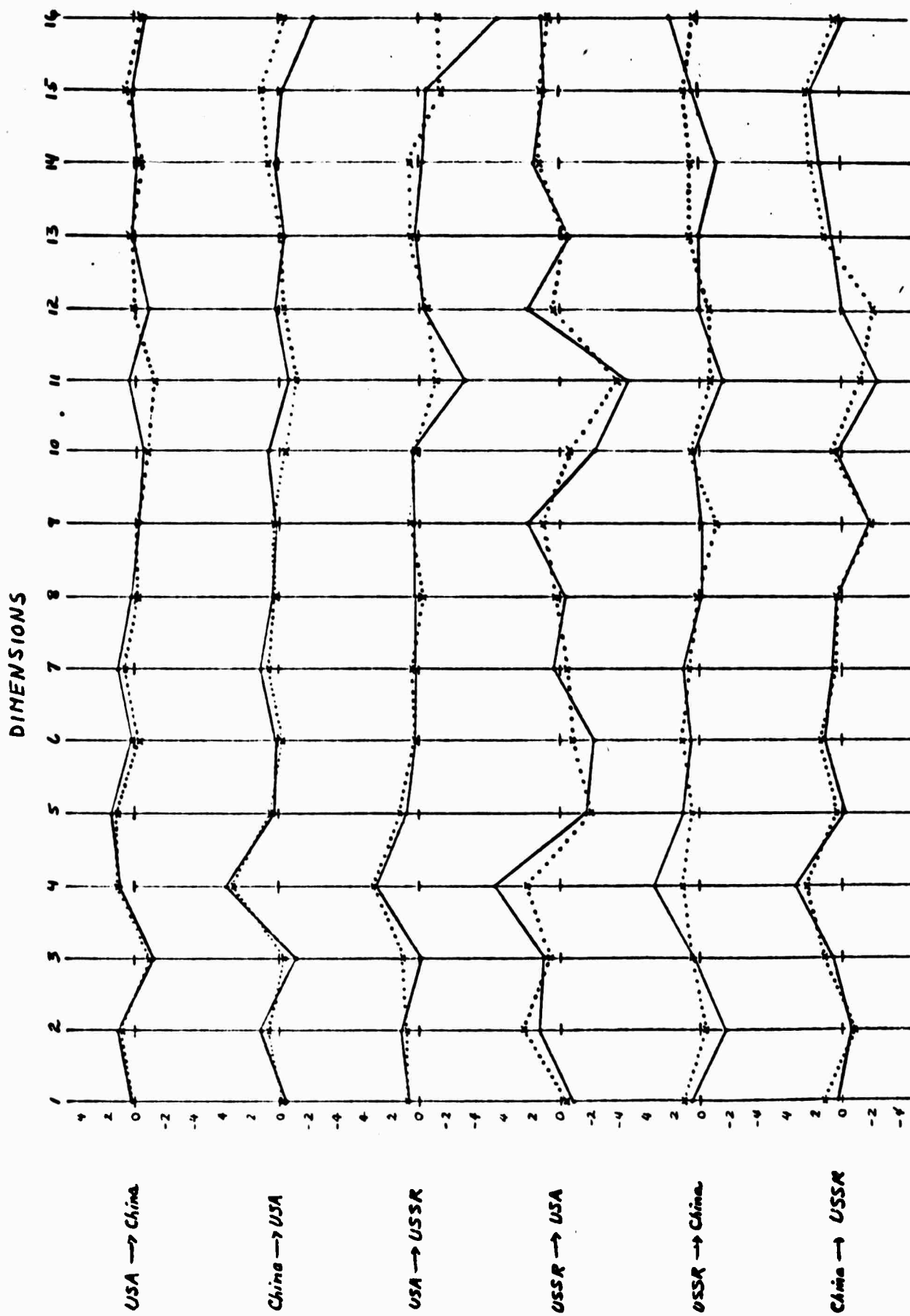
USA → UK

UK → USA

USA → Cuba
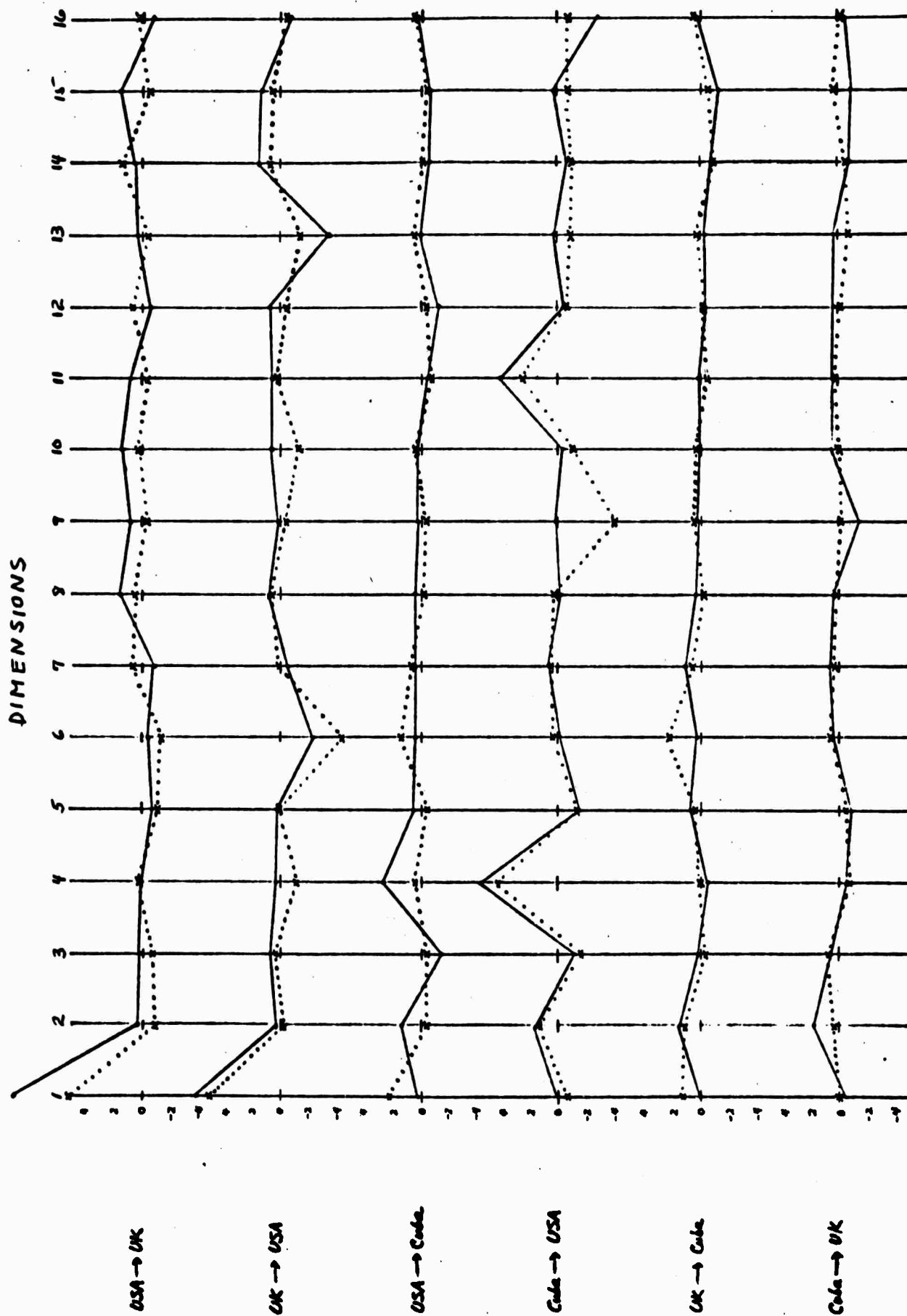
Cuba → USA

UK → Cuba

Cuba → UK

FIGURE 2

the scores on the dimensions representing cooperative type behavior and subtracting those scores on the conflict dimensions. Dyads with much cooperation and little conflict will then be high on the scale, those with mixed behavior will be near zero, and those at the high negative end will have little cooperation and much conflict. The zero point will still represent the average for the 182 dyads.

This scale will be formed for the mutual behavior of the U.S., the U.S.S.R., and China, as well as the dyads US→Cuba, Cuba→US, USSR→Cuba, Cuba→USSR, and, for comparison, US→UK. The dimension to be combined will be taken from S_2 for 1963 and $\hat{S}_2$ for 1955, where $\hat{S}_2$ is the least squares fit to S_2. Thus, differences of scores on the two scales for the same dyad represent shifts in behavior relative to the 182 dyads.[17]

The dimensions to be summed to represent cooperation are salience, migrants (signs reversed), exports (signs reversed), students, diplomatic, international organizations, and UN voting agreement. Those dimensions to be subtracted from the above sum are Cold War, deterrence I and II, and negative sanctions. The military treaties and aid dimensions will be omitted, since they are wholly absent for 1955.

Figure 3 shows the cooperation-conflict scales for 1955 and 1963, with the shift in behavior. The effect of the growing Sino-Soviet split on their behavior is pictured, with the impact greater on the Soviet behavior to China than the other way around. China was much more cooperative with the U.S.S.R., relative to conflictful, than was the U.S.S.R. to China. This

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[17]Thus, if the absolute conflict behavior of US→USSR is at the same level in 1955 and 1963, but in 1963 there is more conflict among the other dyads, then the US→USSR dyad will shift to less relative conflict in 1963.

COOPERATION

1955   1963
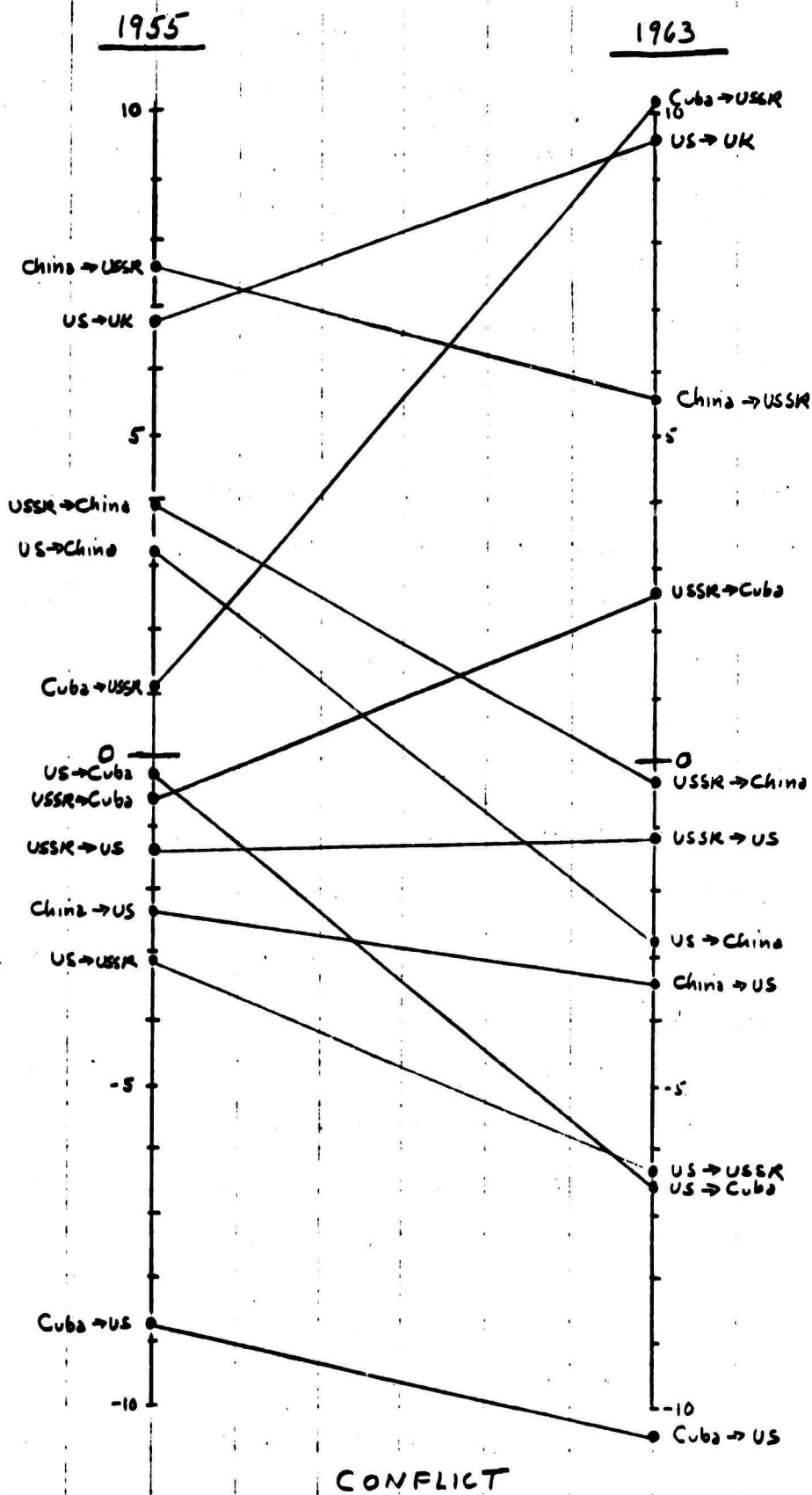
CONFLICT

FIGURE 3

reflects the comparatively large amount of interaction China had with the
U.S.S.R. compared to other nations, while for the U.S.S.R., China was only
one of many countries.

The change in Cuban government and ideology between 1955 and 1963
is mirrored in the very large shift of Cuban to U.S.S.R. and U.S. to Cuban
cooperation relative to conflict. The Cuban to U.S. behavior is extraordina-
rily conflictful for both 1955 and 1963. While 1963 is understandable (con-
sidering the Bay of Pigs invasion and the Cuban Missile Crisis within the
past two years), the conflict relative to cooperative behavior of Cuba to
the U.S. in 1955 is incredible. How can this be explained?

The 1955 behavior of Cuba→US (from matrix S_1), the scores for which
are given in the Appendix of Rummel (1969b), appear by themselves to predict
no great conflict behavior in 1963. The only scores greater than the absolute
value of 1.00 (since these are standardized scores, 1.00 is one standard de-
viation from the mean score for 182 dyads) are for the 1955 exports (11.46)
and migrants (1.30) dimensions. It is not conflict behavior of Cuba in 1955
that predicts to conflict in 1963, therefore, but the particular combination
of nonconflict behavior of Cuba in 1955.

The transformation matrix B of equation (2) will tell what linear
combination of behavior in 1955 best predicts 1963 behavior. From this
matrix, the following prediction equations are derived:

$$\text{deterrence } I_{63} \doteq .38 \text{ exports}_{55} + .24 \text{ students}_{55}$$
$$-.31 \text{ negative sanctions}_{55} + .29 \text{ deterrence}_{55},$$
$$\text{deterrence } II_{63} \doteq .22 \text{ exports}_{55} - .47 \text{ deterrence}_{55},$$

where the dimensions on the right are the 1955 dyadic behavior dimensions
discussed previously[18] and $\doteq$ means approximately.

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[18] Only dimensions with coefficients greater than $|.20|$ are shown.

These equations show that Cuba→US 1963 conflict behavior is well predicted by her tremendously high relative exports and lack of 1955 deterrent behavior toward the U.S. As more analyses along this line accumulate, it will be important to note whether this same configuration of non conflict behavior at one point in time enables the prediction of conflict at some future time. If it does, then the above equations provide a way of forecasting future conflict behavior.

Turning now to the two major protagonist in the world, the relative behavior of the U.S.S.R. to the U.S. remained fairly constant for 1955 and 1963--a mix of cooperative and conflict behavior,[19] which relative to the other 182 dyads is not far below average. The U.S. behavior toward the Soviet Union, however, shows a marked relative decline in the direction of more conflict (or less cooperation), perhaps as an aftermath of the Cuban Missile Crises.

With regard to China and the U.S., China's behavior was far more conflictful to the U.S. in 1955 (or less cooperative) than the behavior received from the U.S. For both China to the U.S. and the U.S. to China, relations grew worse in 1963.

In sum, the cooperation-conflict scale captures fairly well, with the one pronounced anomaly being Cuba's behavior to the U.S., the behavior and shift in behavior for 1955 and 1963 which the student of international relations would expect. This provides a quantitative summary measure of behavior during these years and, along with the scores on the separate dimensions, locates dyads in behavior space relative to each other.

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[19]One of the virtues of this scale is that it takes all behavior into account and not just those which are journalistically prominent, such as threats.

The next problem is to link the different positions of dyads in behavior space to their distance vectors in attribute space. That is, to determine the dependence of these behavioral measurements on the **similarities** and differences between actor and object as specified by field theory. But, this is the subject of another research report (Van Atta and Rummel, 1970).

REFERENCES

Hall, Dennis, and R. J. Rummel. "The Patterns of Dyadic Foreign Conflict Behavior for 1963." Research Report No. 12. Dimensionality of Nations Project, Honolulu: University of Hawaii, 1968. (Also forthcoming, Journal of Multivariate Research).

Park, Tong-Whan. Asian Conflict in Systematic Perspective: Application of Field Theory (1955 and 1963). Ph.D. Dissertation, Honolulu: University of Hawaii, 1969 (and Research Report No. 35, Dimensionality of Nations Project).

Pratt, Richard, and R. J. Rummel. "Issue Dimensions in the 1963 United Nations General Assembly." Research Report No. 21. Dimensionality of Nations Project, Honolulu: University of Hawaii, 1969.

Rummel, R. J. "A Field Theory of Social Action with Application to Conflict Within Nations." General Systems Yearbook, Vol. 10, 1965, 183-211.

Rummel, R. J. "Some Dimensions in the Foreign Behavior of Nations." Journal of Peace Research, No. 3, 1966, 201-224.

Rummel R. J. "Indicators of Cross-National and International Patterns." The American Political Science Review, Vol. LXIII, No. 1 (March 1969a),127-147.

Rummel, R. J. "Field Theory and Indicators Of International Behavior." Research Report No. 29. Dimensionality of Nations Project, Honolulu: University of Hawaii, 1969b (and Paper Presented to the American Political Science Assocation Meetings, New York, September, 1969).

Rummel, R. J. Applied Factor Analysis. Evanston: Northwestern University Press, 1970a.

Rummel, R. J. "U.S. Foreign Relations: Conflict, Cooperation, and Attribute Distances." Research Report No. 41. Dimensionality of Nations Project, Honolulu: University of Hawaii, 1970b (and Paper Presented to the American Political Science Association Meetings, Los Angeles, September, 1970).

Rummel, R. J. "Social Time and International Relations." Research Report No. 40. Dimensionality of Nations Project, Honolulu: University of Hawaii, 1970c (and Paper Presented to the International Political Science Association Meetings, Munich, West Germany, September, 1970).

Strausz-Hupe, Robert, and Stefen T. Possony. International Relations in the Age of the Conflict Between Democracy and Dictatorship. New York: McGraw-Hill, 1950.

Van Atta, Richard, and R. J. Rummel. "Testing Field Theory on the 1963 Behavior Space of Nations." Research Report No. 43.

Dimensionality of Nations Project, Honolulu: University of Hawaii, 1970 (and Paper Presented to the Seventh European Peace Research Society (International) Conference, Rome, Italy, August 29-31, 1970).

Wall, Charles, and R. J. Rummel. "Estimating Missing Data." Research Report No. 20. Dimensionality of Nations Project, Honolulu: University of Hawaii, 1969.

Williamson, Paul. "DON Technical Memorandum." Dimensionality of Nations Project, University of Hawaii, June 28, 1970.

APPENDIX I

Variable Definition and Data Sources

1. Economic Aid. Economic aid refers to amounts expended in grants or
   long term loans in cash and kind, including in the latter category
   the provision of services as well as commodities. Figures included only
   aid distributed through official agencies.
   Source.[1] Flow of Financial Resources to Less Developed Countries
   1956-63, p. 84, Table 4. The Foreign Assistance Program---Annual Report
   to the Congress for Fiscal Year 1963 (U.S. Agency for International
   Development), p. 59, p. V, p. 127. British Aid 4, Technical Assistance,
   by Peter Williams, ODI, Appendix I.
   Soviet Foreign Aid, by Goldman, Marshall I., p. 28.

2. Relative Economic Aid. See variable 1 for the definition of economic
   aid. Footnote b to Table 1 defines "relative."
   Source.[2] Same as variable 1. Also Bulletin of the Atomic Scientists,
   Sept. '66, pp. 46-7. Flow of Financial Resources to Less Developed
   Countries, 1961-65, OECD, 1967, p. 60, p. 34.

3. Treaties. Treaties were defined as including all bilateral and
   multilateral treaties and agreements signed during 1963 and deposited
   during 1963-66. Along with the formal treaties and agreements were

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[1]Miscellaneous sources are utilized in instances where there is
no single source from which ten percent or more of the data was taken.

[2]For any variable $\frac{i \rightarrow j}{i}$ or $\frac{i \leftrightarrow j}{i}$ the source notations will refer
to sources from which data were collected for A.

included supplementary agreements or extensions of agreements; exchanges
of notes constituting an agreement or amending a formerly signed agreement;
acceptances; conventions; protocols; notifications of agreements; depo-
siting of instruments of accession and adhesion; those declarations by a
country stating that it considered itself bound by a treaty, agreement,
etc., the application of which had been extended to their territory prior
to the attainment of independence; and in general those declarations indi-
cating the continuation of a former "agreement." With regard to accep-
tances, an agreement may be signed without reservation as to ratification
and acceptance, it may be signed with a specification that it must later
be accepted, or it is possible to become a member of an agreement by
depositing an instrument of acceptance. Therefore, a notification of
acceptance was not counted whereas acceptances or depositing of the in-
strument of acceptances were counted. Qualified declarations, such as
those made by the United Kingdom stating that a certain treaty, agreement,
etc., is applicable or not applicable to certain of her colonies or other
possessions, terminations, entry into force and ratification or depositing
of ratification instruments, were not included in our definition. We
were concerned with measuring the amount of cooperative interaction among
nations, and it was decided that signatures to agreements--which reflect
a state of mind--rather than ratification which actually bind nations to
treaties would serve as valid indicators of cooperation.

Source. Statement of Treaties and International Agreements, U.N.

4. Relative Treaties. See variable 3 for definition and source.

5. Official Visits. First, "visits" are defined as by one nation (actor)
to another nation (object) not involving participation in an international

conference of three or more nations. Second, "visits" comprise state
visits, official visits, or personal visits (e.g. for reason of health).
Third, the count of "visits" is restricted to those by a chief of state,
president, prime minister, secretary of state, foreign minister, emperor,
king or queen, or first secretary of the communist party.

Source. Daily The New York Times for 1963.

6. Co-participation in International Conferences. First, "conferences"
involve three or more nations. Second, a "conference" is any international
conference outside of the regular or emergency U.N. Security Council or
General Assembly meetings. Third, the count of "conferences" is
restricted to those involving officials mentioned in (c) for visits.

Source. Daily The New York Times for 1963.

7. Export of Books and Magazines (Printed Matter). The definition of
printed matter was taken from the Standard International Trade Classifica-
tion (SITC) #892, Revised U.N. Statistical Papers, Series M, No. 38,
Vol. II, 1963, p. 41 and comprises the following categories:

892.1 Printed books and pamphlets, including maps and globes

    892.11 printed books, pamphlets, etc.

    892.12 children's picture and painting books

    892.13 maps, hydrographic charts, etc.

892.2 Newspapers and periodicals

892.3 Music, printed or in manuscript

892.4 Picture postcards, picture greeting cards and transfers

    892.41 transfers

    892.42 postcards, greeting cards, etc.

892.9 Printed Matter, n.e.s.

    892.91 paper or paperboard labels

892.92 plans and drawings for industrial or commercial purposes, etc.

892.93 unissued postage and similar stamps, banknotes and similar

documents of title.

892.94 calendars of paper

892.99 other printed matter, including pictures and photographs.

Source. Trade by Commodities, Statistical Bulletin C, Vol. I, Exports,

January to December 1963, OECD, Paris, 1964, pp. 552-555; Vol. II, Imports,

p. 333, Annual Supplement, Series C, Paris, 1965; Country tables, Series

D, Vol. XIII, no. 1-25. 1963 World Trade Annual, Vol. III, Statistical

Office U.N., 1964. Monthly Trade of the Foreign Trade of India, Vol. I-II,

Exports and Re-exports, March 1964, Department of Commercial Intelligence

and Statistics, Calcutta.

8. Relative Export of Books and Magazines (Printed Matter). See variable 7
for definition and source.

9. Book Translations. The number of translations by i from a language that
is the major spoken language of j (when the language from which a work
was translated differed from the original language of the work, the
original language was used in all data counts).
Source. Index Translationum for 1963, UNESCO, Paris, 1965. UNESCO
Statistical Yearbook, 1964, UNESCO, Paris, 1966, Table 31, pp. 424-428.
Sources used in determining the dominant spoken language of sample coun-
tries were· World Handbook of Political and Social Indicators by
Bruce Russett et al., Yale University Press, 1964, Table 39. Worldmark
Encyclopedia of the Nations, New York, 1963.

10. Relative Book Translations. See variable 9 for definitions and source.

11. Military Violence. This variable consists of factor scores on a military
violence dimension from an orthogonally rotated (varimax) component

analysis of 24 conflict variables and conflict data for 275 dyads. Data involved all conflict reported in the daily The New York Times for 1963. Source. Dennis R. Hall and R. J. Rummel, "The Patterns of Dyadic Foreign Conflict Behavior for 1963," Research Report No. 12, Dimensionality of Nations Project, University of Hawaii, 1968 (forthcoming, Journal of Multivariate Research).

12. Negative Communications. Factor scores on a negative communications dimension. See variable 11.

13. Negative Sanctions. Factor scores on a negative sanctions dimension. See variable 11.

14. Anti-Foreign Violence. Factor scores on an anti-foreign violence dimension. See variable 11. This factor comprises such behavior as attacks on embassy of j, on j's military personnel in i, and on j's flag.

15. Warning and Defensive Acts. Factor scores on a warning and defensive acts dimension. See variable 11.

16. Total Conflict Behavior. Sum of factor scores for variables 11-15.*

17. Incidence of Conflict Behavior. A "peace dyad" with all zero values on the conflict variables was included in the component analysis from which the above scores (variables 11-15) were taken. "Incidence" of conflict behavior is defined as a factor score greater or equal to one standard deviation of the peace dyad's scores on any one of the five factors (variables 11-15). All scores are standardized, so that the standard deviation equals 1.00. Incidence = 1.0, nonincidence = 0. Source. Same as variable 11.

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*High scores on each of the dimensions measured high conflict behavior.

18. j is in conflict with military ally of i. Conflict is defined as being greater or equal to 1.5 standard deviation of the peace dyad's score on any one of the five factors (variables 11-15). See variable 17. The variable is coded 1.0 if anyone of the following three conditions holds: j is in conflict with a military ally of i, i is in conflict with a military ally of j, i is in conflict with j, where "military allies" are those having a military defense treaty. If any of these conditions do not hold, the variable is coded zero.

     Source. See variable 11.

19. Military Treaties. includes all bilateral and multilateral treaties or agreements signed in 1963 which have as their purpose the committment or receipt of any form of military aid to or from other signatures to the treaties and that were filed with the Secretary General of the U.N. during 1963-1966. The same general definition of treaty is applied as for variable 3.

     Source. See variable 3.

20. Relative Military Treaties. See variable 19, for definition and source.

21. Weighted Similarity on Major Rotated Dimensions of UN Voting. The voting variables are the standardized reciprocals of the Euclidean distance between nations on the major orthogonal dimensions of U.N. voting in the XVIIIth (1963) General Session of the United Nations. To determine the dimensions, all roll calls in the Plenary Session and Assembly Committees were factor analyzed. Six dimensions were delineated. The weighted U.N. voting similarity is the reciprocal of the Euclidean distance between i and j on all six dimensions, where each dimension is weighted by the proportion of variance in roll calls it extracts.

Source. Richard Pratt and R. J. Rummel, "Issue Dimensions in the 1963 United Nations General Assembly," Research Report No. 21, Dimensionality of Nations Project, University of Hawaii, 1969, (forthcoming, Journal of Multivariate Research).

22. Unweighted Similarity on Major Rotated Dimensions of UN Voting. Same as variable 21, except each o f the six U.N. dimensions was given equal weight in determining the distance.

    Source. Same as variable 21.

23. Similarity in U.N. Voting on Cold War Issues. Similarity in voting on the Cold War issue dimension of UN voting for 1963. See variable 21.

24. Similarity in U.N. Voting on U.N. Procedural Issues. Similarity in voting on the UN Procedures issue dimension of U.N. voting for 1963.

25. Similarity in U.N. Voting on South African Issues. Similarity in voting on the South African issue dimension of U.N. voting for 1963.

26. Tourists. These are defined as persons: 1) travelling for pleasure, domestic reasons, for health, etc.; 2) travelling to meetings, or in a representative capcity of any kind (scientific, administrative, diplomatic, religious, athletic, etc.); 3) travelling for business purposes; 4) arriving in the course of a sea cruise, even when they stay less than twenty-four hours.

    Source. International Travel Statistics, 1963, International Union of Official Travel Organization.

27. Relative Tourists. See variable 26 for definition of tourists. This variable is the ratio of the number of tourists $i \rightarrow j$ to the total number of tourists arriving in j.

    Source. Same as variable 26.

28. <u>Tourists/i's Population</u>. See variable 26 for definition and source of tourists data.

Source. Population data source is <u>UN Demograpic Yearbook</u>, 1965.

29. <u>Emigrants</u>. Nationals leaving their coutry with the intention of staying abroad for a period exceeding one year.

Source. <u>Statistical Abstract of Israel</u>, 1966, No. 17, p. 196, Table 0/17. <u>Statistical Abstract of the U.S.</u>, 1965, p. 93, Table 117. <u>Great Britain Central Office Annual Abstract of Statistics</u>, 1965, No. 102, p. 18. <u>International Migration Digest</u>, Vol. I, No. 2, Fall 1964, p. 207. <u>Worldmark Encyclopedia of the Nations</u>. <u>Republic of South Africa Monthly Bulletin of Statistics</u>, Bureau of Statistics, <u>Pretoria</u>, January, 1967. <u>Annuaire Statisque De La Suisse</u>, 1966. <u>Statistical Yearbook of Norway</u>, p. 39. <u>Statistical Yearbook of Denmark</u>, p. 63, 1965. <u>Statistical Abstract of Sweden</u>, 1965, p. 55, Table 47. <u>Statistical Yearbook of Finland</u>, New Series 61st, 1956, p. 70, Table 61. <u>Yearbook of the Commonwealth of Australia</u>, 1965, p. 286.

30. <u>Relative emigrants</u>. See variable 29 for definition and source.

31. <u>Emigrants/A's Population</u>. For definition and source of emigration data see variable 29.

Source. For population source see variable 28.

32. **Students**. A foreign student is any citizen of i enrolled at an institution of higher education in j.

Source. <u>UNESCO Statistical Yearbook</u>, 1964, Paris 1966, Table 18, pp. 270-277.

33. <u>Relative Students</u>. See variable 32 for definition and source.

34. <u>Exports</u>. Value of all exports i→j.

Source. <u>Direction of Trade Annual</u>, 1961-65, IMF & IBRD, Country tables.

Commodity Trade Statistics, 1963, Statistical Series Papers, Series D,
Vol. XIII, No. 1-25, U.N., Statistical Office, N.Y., 1964. Yearbook of
International Trade Statistics, 1964, U.N., 1966, Country tables.
Economic Bulletin for Asia and the Far East, Vol. XVII, No. 2, Sept. 1966,
U.N., Table 7, pp. 72-77. Yearbook of International Trade Statistics,
1964 & 1965, U.N., N.Y., 1966 & 1967. Trade by Commodities, Vol. I,
Exports and Vol. II, Imports, OECD, Statistical Bulletin Series C,
Jan-Dec 1963. Foreign Trade Statistics of Africa, Series A, Direction of
Trade, No. 6, U.N., Economic Commission for Africa, Country Tables.
Worldmark Encyclopedia of Nations.

35. Relative exports. See variable 34.

36. Exports/i's GNP. For definition of exports and data source, see variable
34. GNP is defined as the total value of goods and services produced in
a country in a year's time.

Source. For GNP: Trade Aid and Development by John Pincus, Council for
Foreign Relations, McGraw Hill Book Co., N.Y., 1967, Tables 4 & 8, pp. 61,
69-71.

37. Largest Commodity Export/i's total Exports. The definition of "largest
commodity" was $\frac{i_c \rightarrow j}{i_T}$, where "c" is i's largest commodity export to all
countries and "T" is i's total exports to all countries. The variable
defines proportion, i_c, of i's largest commodity export that goes to j
as a proportion of i's total exports to j.

Source. Trade by Commodities, Vol. I, Exports, Statistical Bulletin
Series C, Jan-Dec 1963, OECD, Paris, 1964. Trade by Commodities, Annual
Supplement, Statistical Bulletin Series C, Jan-Dec 1963, OECD, Paris,
1964, Country tables. Commodity Trade Statistics, 1963, Statistical
Papers Series D, Vol. XIII, No. 21-25, U.N., N.Y., 1964, Country tables.

Monthly Statistics of the Foreign Trade of India, Vol. I, Exports and
Re-export, March 1964, Department of Intelligence and Statistics,
Calcutta, 1964. The Source for total exports of A was: Yearbook of
International Trade Statistics, 1963, U.N., N.Y., 1965, Table A,
pp. 12-19.

38. Intergovernmental Organizations (IGO) of which i and j are co-members.
The number of common memberships in any of 161 intergovernmental organiza-
tions shared by i with j.

Source. Computer list of data collected by Steven Brams from the
country IGO table in the Worldmark Encyclopedia of the Nations: United
Nations, N.Y., Worldmark Press, 1963, pp. 258-65.

39. Relative IGO. For the definition of IGO data see variable number 38.

40. Nongovernmental International Organizations (NGO) of which i and j are
both members.

Source. The Yearbook of International Organizations, 1964-65, Part IV,
#413-1882, pp. 294-1522.

41. Relative NGO. See Variable 40 for source.

42. Weighted relative IGO. This is the ratio of the number of IGO co-member-
ships i↔j to the total number of dyadic co-memberships in IGO of i.
For example, if an IGO has 5 members including i, then i will have 4
dyadic relationships for this IGO. Thus, the ratio takes account of the
degree to which i and j are co-members of small IGOs.

Source. Diplomatic Exchanges, Trade, and Common memberships in Inter-
governmental Organizations; Statistics and TAbles, Table 2, p. 6, by
Steven Brams. Brams data was collected and calculated from the Worldmark
Encyclopedia of the Nations, 1960, Part II, The United Nations System.

43. Weighted relative NGO. See variable 42. For source, see variable 40.

44. Embassy and Legation. An embassy or legation of i exists in j = 1.00,
    no = 0.

    Source. Statesman's Yearbook, 1962-63.

45. Relative Diplomatic Representation. For definition and source, see
    variable 43.

46. Diplomats Sent. Number of Career-level diplomats of i residing in the
    national capital of j, as reported by j.

    Source. "Patterns of Representation in National Capitals and Inter-
    governmental Organizations," by Chadwick Alger and Steven Brams, World
    Politics, Vol. XIX, No. 4, July 1967.

47. Relative Diplomats. For variable definition and source, see variable 45.

48. Telephone Linkages. Direct telephone communication channels , between
    i and j = 1.0, none or indirect communication channels = 0.

    Source. List of Telephone Communication Channels in: Europe, Africa,
    Americas, Asia, Oceania, List of Intercontinental Communication Channels.
    Publié par l'union internationale des telecommunications, Geneva, 1964.

49. Time Since on Opposite Side of War. If i and j were on opposite sides
    of a war prior to 1900 = 0, 1900-1910 = 1, 1911-1920 = 2, 1921-1930 = 4,
    1931-1940 = 8, 1941-1950 = 16. 1951-1960 = 32, 1961-1963 = 64.

    Source. A Study of War by Quincy Wright, University of Chicago Press, 1965.

50. Time Since on Same Side of War. Same scaling and source as variable 49.

51. i Has Lost and not Regained Territory to j Since 1900 = 1; No = 0.
    Territory lost or gained is based on territorial changes since 1900.
    Occupation of a territory by another country during wartime is disregarded.
    However, if the territorial change becomes permanent after the war has
    ended then it is counted. Territorial changes for new nations are

recorded only after the country has gained independence. Colonies, or
parts thereof, lost or gained are recorded (and later independent
nations) themselves. For example, loss of a colony by Germany to
Britain is recorded as a gain of territory by Britain at the expense of
Germany. Also disregarded are divisions of an area into other countries,
e.g., Columbia into Panama and Columbia; and India into Pakistan and
India.

Source. Worldmark Encyclopedia of Nations. New York, Harper and Row,
1963.

52. i Once a Colony, Territory, or Part of Homeland of j. For scaling, see
variable 49.

Source. Information Please Almanac, 1964; Worldmark Encyclopedia of
Nations, 1963; The Statesman's Yearbook, 1963-64.

53. Independence of i and j Predates 1946 = 1; No = 0. The independence
data is defined as when independence is granted by the mother country
and recognized as such by both the mother country and the colony.
Occupation of a country during war is considered an aberration and
hence not counted.

Source. See variable 52.

54. Common Bloc Membership of i and j = 2; Different = 1; Opposing = 0.
Blocs are Western, Eastern (communist), and Neutral. A military
defense treaty with the US = Western; with USSR = Eastern; with neither =
neutral.

Source. Information Please, 1963 and 1964; The Statesman's Yearbook,
1962-63 and 1963-64; Worldmark Encyclopedia of Nations, 1963.

55. Bloc Position Index. Bloc position i↔j is measured as the absolute
different of position between i and j on the following scale.

1	2	4	6	7
USA	Non-USA Western Bloc Member	Neutral Bloc Member	Non-USSR Communist Bloc Member	USSR

Source. See variable 54.

56. <u>Military Alliance i</u> i = 1; no = 0. A military alliance was defined as a defense treaty or pact in which each member pledged to come to the defense of any other member if attacked.

Source. See variable 54.